Newsletter of the North American Mycological Association

THE MYCOPHILE

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REGISTRATION FOR THE NAMA 2016 SHENANDOAH FORAY OPENS MAY 15!

Join us this September 8-11 for the NAMA 2016 Shenandoah Foray, hosted by the Mycological Association of Washington, DC and the New River Valley Mushroom Club. Attendance is limited to 350, and the foray is likely to sell out. So be sure to register as soon as you can at namyco.org/events.php.*

We will stay at the Northern Virginia 4-H Center, just a few minutes' drive from Shenandoah National Park. Come explore the rolling hills, mountain streams, and hardwood forests that make this region beloved to so many -- and find out why they say Virginia is for (mushroom) lovers!

***Normally, you can view all pages and content on the NAMA website without being logged in. However, to register for the 2016 Foray, you'll need your login and password. If you've forgotten yours, enter your email address on this page: click here to reset your password. Once you ask for a resend, the temporary password needs to be used within three hours. For further assistance, contact Steve Bichler membership@namyco.org.**

FORAY SCHEDULE

Wednesday, September 7	• Early check-in available (at extra cost) from 3:00 to 6:00 – this option is available to all registrants, but especially recommended for NAMA Trustees.
Thursday, September 8	• Trustees Meeting in the morning. • Early bird field trip, dyeing workshop, and grad student talks in the afternoon. • Check-in for Thursday arrivals from noon to 6:00 PM. • Official foray begins with dinner, evening presentations, and social time.
Friday, September 9 & Saturday, September 10	• Field trips and presentations all day. • Evening presentations and social events.
Sunday, September 11	• Final walk-through of the foray's fungi. • Checkout by noon; lunch provided.

UPCOMING FORAYS & OTHER EVENTS

This section of **The Mycophile** is reserved for publicizing the annual forays of NAMA affiliated clubs and other events you may be interested in learning about. If you would like us to list your club's next big event, contact us with details you would like displayed here and send to Dianna Smith, editor of NAMA's bi-monthly newsletter: mycophile@namyco.org. See also http://www.namyco.org/events.php about posting on our website.

July 3-9: *Lichens and Lichen Ecology* with David Richardson and Mark Seaward at Eagle Hill Institute, Maine, http://www.eaglehill.us

July 22-23: West Virginia Mushroom Club Foray with Gary Lincoff, Walt Sturgeon, Kim and John Plischke III, and Max Dubansky. For detailed information and foray registration go to http://wvmushroomclub.org/.

July 28-31: Northeast Mycological Federation (NEMF) 40th Annual Sam Ristich Foray will be held at Fitchburg State University in central MA close to the NH border. Chief mycologist will be David Hibbett of Clark University. Registration is now open at www.NEMF.org.

July 31-August 6: *Mushroom Identification for New Mycophiles: Foraging for Edible and Medicinal Mushrooms* with Greg Marley and Michaeline Mulvey at Eagle Hill Institute, Maine, http://www.eaglehill.us

August 7-13: Eagle Hill Institute Seminar on *Slime Molds: Miniature Marvels of Nature* with Steven Stephenson, http://www.eaglehill.us

August 18-21: Wildacres Foray (Note the August date - first time). Cost will be $240 per person, double occupancy. Dr. Andrew Methven will return as our guest mycologist.

August 21-27: *Polypores and other Wood-inhabiting Fungi* with Tom Volk, Eagle Hill Institute, Maine, http://www.eaglehill.us

September 8-11: NAMA Shenandoah Foray located in the unique environment of the bio-regions of the Blue Ridge Mountains and the Shenandoah Valley of Virginia. Walt Sturgeon will be chief mycologist. The foray will be stationed at the Northern Virginia 4-H Center in Front Royal. http://www.nova4h.com/#landing. Registration opens May 15, 2016.

September 12-15: NAMA class on *Lactarius* taught by Dr. Andrew Methven at Wildacres, N.C. Contact Glenda O'Neil: glendakoneal@yahoo.com or by phone (423)-863-2742. (Please see p. 22 for further information.)

September 24: Western Pennsylvania Mushroom Club's 16th Annual Gary Lincoff Mushroom Foray with Gary Lincoff, Nicolas Money and Chef George Harris. Go to http://www.wpamushroomclub.org/ to register.

September 22-25: Annual COMA Clark Rogerson Foray located in Copake NY in the Berkshires at the intersection of NY, CT and MA. Check for updates and registration online at www.comafungi.org.

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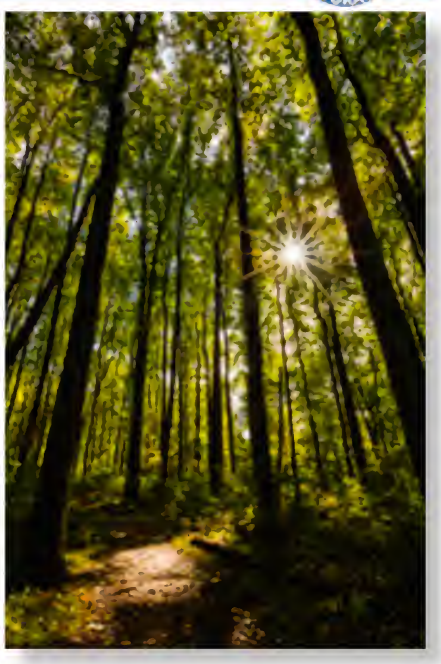
FIELD TRIPS & FUNGI

The foray will be collecting fungi primarily in Shenandoah National Park, in conjunction with the National Park Bioblitz program. The current species list for the park includes 380 fungi, and we hope to expand it with your help.

We have worked with park staff to design a set of half-day and full-day field trips in diverse areas, all within a short drive of the 4-H Center. The foray will provide transportation to most field trips.

The grounds of the 4-H Center are also potential mushrooming territory with habitats including fields, forest, streams, and stables. Access to the Appalachian Trail from the Center grounds will give foray participants limitless opportunities to explore without even getting in a vehicle.

In Virginia, mid-September is prime time for honey mushrooms, as highlighted in the foray logo. With luck we may find choice edibles like chantarelles, hen-of-the-woods, aborted entoloma, black trumpets, and chicken-of-the-woods. We may also be lucky enough to find rare species that have been recorded in Shenandoah National Park including *Boletellus pseudochrysenteroides, Multifurca ochricompacta, Butyriboletus roseopurpureus, Terana coerulea, Entoloma roseum, Gliophorus perplexus, Entoloma euchroum, Atheniella adonis, Inocybe tahquamenonensis, Pholiota flammans, Leucopholiota decorosa*, and *Wolfina aurantiopsis*.

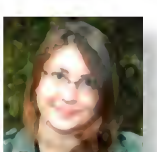


Shenandoah National Park, Photo by N. Lewis

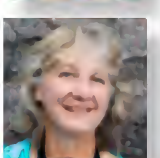
FORAY FACULTY

Walt Sturgeon will be chief mycologist for the Foray. Walt is a past president of the Ohio Mushroom Society, and recipient of NAMA's Award for Contributions to Amateur Mycology and NEMF's Eximia Award. He is author or co-author of *Waxcap Mushrooms of Eastern North America, Mushrooms of Ohio* and *Mushrooms and Other Fungi of the West Virginia High Country*. He is also an award-winning photographer; his pictures appear in many field guides.

Foray faculty also includes more than 20 other speakers, field trip leaders, and identifiers:



Catherine Aime, associate professor of botany and plant pathology at Purdue and director of the Purdue herbaria. Catherine is an expert in the systematics, evolution, and biology of rust fungi.

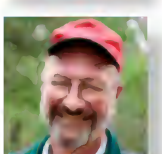


Arleen Bessette, amateur mycologist, photographer, and dyer. With her husband, Alan, Arleen has authored more than 20 books including *Rainbow Beneath My Feet: A Mushroom Dyer's Field Guide.*

Tradd Cotter, owner of Mushroom Mountain, a mushroom farm and research laboratory in South Carolina. Tradd is author of the book *Organic Mushroom Farming and Mycoremediation.*

Alan Bessette, mycologist and professor emeritus of biology at Utica College. Alan and his wife, Arleen, have authored more than 20 books, including Mushrooms of the Southeastern United States.

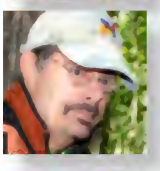
Michael Castellano, researcher at the U.S. Forest Service and associate professor at Oregon State University. Michael is an expert in the ecology and diversity of mycorrhizal fungi, particularly truffles.



Roy Halling, curator of mycology at the New York Botanical Garden. Roy works on mushroom systematics and mycogeography, with a particular focus on boletes.

Mark Jones, CEO of Sharondale Mushroom Farm near Charlottesville, VA. Mark studies and teaches low-input mushroom growing and intercropping mushrooms in food forests.

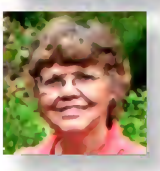
Ryan Kepler, researcher at USDA's Systematic Mycology and Microbiology Laboratory.



Patrick Leacock, NAMA's Voucher Committee coordinator for the Foray. Patrick is a mycologist at the Field Museum of Natural History and is working to build a mycoflora for Chicago's 1,200 species.

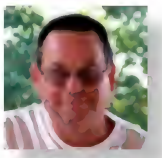
Gary Lincoff, author of The Audubon Society Field Guide to North American Mushrooms and many other publications. Gary teaches courses on mushroom identification worldwide.

Shannon Nix, associate professor of biology at Clarion University. Shannon studies fungal ecosystems and teaches courses in mycology, microbiology, and electron microscopy.



Dorothy Smullen, former president of the New Jersey Mycological Association. Dorothy has nearly 50 years' experience studying mushrooms.

Rytas Vilgalys, professor of biology at Duke University and curator of fungi at the Duke Herbarium. Rytas studies the genetics and natural history of fungi and the origins of fungal biodiversity.



Jay Justice, co-founder of the Arkansas Mycological Society. Jay has studied the fungi of the southeast US for over 35 years.

Michael Kuo, editor of the website MushroomExpert.com. Michael is also author or coauthor of several other publications including *100 Edible Mushrooms and 100 Cool Mushrooms*.

James Lendemer, assistant curator of the Institute of Systematic Botany at the NY Botanical Garden. James is a lichen expert who has collected over 39,000 specimens for the NYBG and fungaria worldwide.

Brian Looney, PhD candidate in ecology and evolutionary biology at the University of Tennessee. Brian is studying macroevolutionary patterns in the russulas.

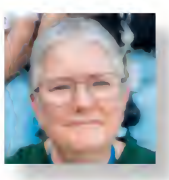
Conrad Schoch, a scientist at the National Center for Biotechnology Information at NIH. Conrad curates the fungal taxonomy at GenBank.

Rod Tulloss, editor of the website Amanitaceae.org. Rod curates a fungarium that includes thousands of amanita specimens.

...and more!

We're still putting the finishing touches on our faculty, but we hope you're as excited as we are to spend some time learning and socializing with this group of experts.

PRE-FORAY WORKSHOP



Foray participants can also sign up for a mushroom dyeing workshop with **Susan Hopkins**, who has been practicing this craft for nearly 25 years. This 3.5 hour pre-foray workshop on Thursday afternoon will be a hands-on introduction to the best species of fungi to use and the general procedure for dyeing wool yarn a variety of colors. Each participant can expect to receive 15-20 short yarn samples dyed using 6-7 different species of fungi and 2-3 different mordants. The $35 workshop fee covers all materials and equipment, plus several handouts on mushroom dyeing.

LODGING & TRANSPORTATION

The Northern Virginia 4-H Center is located just outside Front Royal, VA. Foray participants have a choice of several lodging options at the Center:

- Private rooms, with or without air conditioning;
- Dorm rooms, shared with up to 5 other participants; or
- Camping in the 4-H Center athletic field.

Participants also have the option to arrange their own lodging in Front Royal, and pay a commuter rate that covers food and registration. We are holding a block of rooms at the Quality Inn Skyline Drive ($67/night plus tax), which can be reserved by calling (540) 635-3161.

The basic package for the foray includes 3 nights (Thursday, Friday, and Saturday) and 9 meals (Thursday dinner through Sunday lunch). You may choose to pay extra to arrive one day early and start meals with Wednesday dinner.

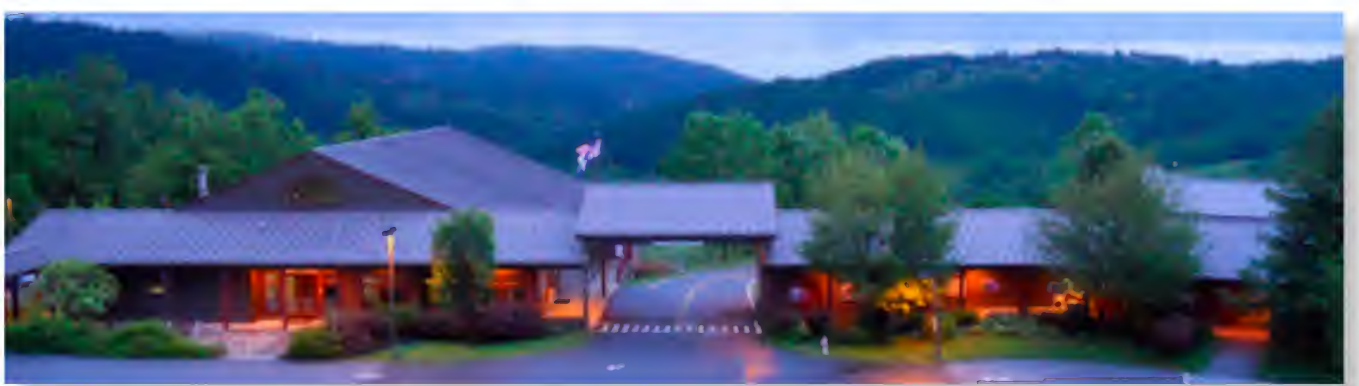
For more information or for assistance with registration, please contact the Registrar, Connie Durnan: czdurnan1@verizon.net or (202) 669-5749.

	PRIVATE ROOM W/AC	PRIVATE ROOM, NO A/C	DORM	CAMPING	COMMUTER
	$552 single $393 double $326 three or more	**$486 single $360 double $310 three or more**	**$264**	**$222**	**$218**
Add-on for early arrival (Wed)		**$100**	**Not available**	**$35**	**$35**

Note: Single is the rate paid by one person who is the only occupant of a private room. Double is the per-person rate paid by two individuals sharing a room. The "three or more" rate is the per-person rate paid by three or more individuals sharing the same room.

At Foray time, average highs in Front Royal tend to be about 80°F, and average lows are in the mid-50s. Washington Dulles International Airport (IAD) is the closest major airport, about 60 miles away. You may wish to rent a car from the airport both for transportation to and from the 4H Center and to take advantage of all the sight-seeing opportunities in the Shenandoah area.

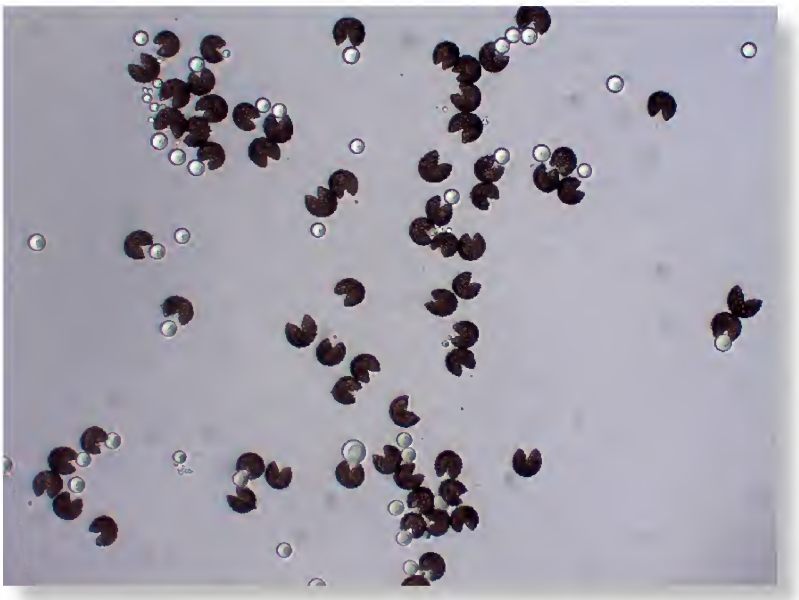
We encourage you to consider whether you might want to stay longer in the area – there's so much to do! In the Front Royal area, you can visit wineries and breweries, Civil War sites, and caverns – and there is always more to explore in the National Park. Washington, DC and its many sights and activities are about 90 minutes away.



NAMA 2015 PHOTOGRAPHY AWARDS

Photos of the winning entries to the 2015 NAMA Award for photography: **JUDGES' OPTION CATEGORY**
Linda Sears, 1st place for *Bowing Geisha Ganoderma*
Robert Solem, 2nd place for Pacman 400X microphoto of *Strobilomyces sp.*
Michael Beug, 3rd place for *Morchella* Mel-19

Bowing Geisha Ganoderma by Linda Sears



400X micrograph of *Strobilomyces sp.* by Robert Solem

Morchella Mel - 19 by Michael Beug

HONORABLE MENTION

Brian Looney for *Hygropsychedelia*

Joe Brandt for *Myco Troll Doll*

Patrick Harvey for *I Don't Want That One*

Hygropsychedelia by Brian Looney

Myco Troll Doll by Joe Brandt

I Don't Want That One by Patrick Harvey

The Complex and Copious Interactions of Fungi, Insects, Nematodes and Other 'Bugs'

By Carl DeBoer, Editor of *Mycelium*,
Newsletter of theMycological Society of Toronto

The soil-covered cocoon of a lepidopteran (moth or butterfly) pupa with *Isaria* fruiting bodies.
Photo by Carl DeBoer

Insects, other arthropods ("bugs") and nematodes have some particularly interesting relationships with fungi. If you've ever collected a wormy mushroom, you've seen one of these many interactions first-hand. These relationships span the gamut of symbioses, to parasitism on the part of the fungi, or predation on the part of the 'bug'. Entire books have been dedicated to the subject and I hope not to produce another, but to give an overview of some of the more interesting and important examples.

The cocoon has been cut away to reveal the mummified pupa.
Photo by Carl DeBoer

Adversaries

Parasitizing insects is such a profitable lifestyle that it arose over the course of evolution more than once within fungi. Parasitism ranges from the slightly inconvenient parasites to the rapidly lethal. At one end, fungi like the members of Laboulbeniales allow their host to go about business pretty much as usual, only tapping a small amount of nutrition from the host. At the other extreme are perhaps the best known fungal insect parasites: members of the *Cordyceps* genus. *Cordyceps* species are found worldwide. The more well known *Cordyceps* species include the "vegetable caterpillar" (*Ophiocordyceps sinensis*) and the several species known for making zombie ants (described further below). Many species have both a sexual and an asexual lifecycle, both of which parasitize bugs. For instance, the genus *Isaria* is comprised of *Cordyceps* anamorphs (asexual forms). As with many other fungal insect pathogens, the first stage of infection is when a spore sticks to the exoskeleton of the correct host arthropod - many *Cordyceps* species are very particular in the types of hosts they infect. However, insects are not powerless to stop these fungal invaders. Some will go into the sun or otherwise try to raise their body temperatures to combat the infection, essentially giving themselves a fever.

Some *Cordyceps* are so effective at killing pests that we make use of them as a biological insecticide. *Beauveria bassiana* (actually a complex of similar species, one of which is the anamorph of *Cordyceps bassiana*) is the most common of these and is commonly used to control pests including termites, whiteflies, certain beetles, and aphids. Once a spore of *B. bassiana* contacts a host, it penetrates the exoskeleton and kills the host within a few days. Once dead, a white mold emerges from the corpse to produce spores and infect the next generation of hosts.

Some fungi, including many *Cordyceps* and members of the Entomophthorales are also known for reprogramming

Stages of fly infection by *Entomophthora muscae*. (A) A fly with summit disease. This fly and several nearby persistently guarded their positions at the tops of an asparagus plant. Although still capable of flying, poking them would only make them take to the air for half a second to reposition themselves on the asparagus. Soon the flies lose the ability to fly at all and, although still living, simply cling to the plant and wait for the end. (B) A recently deceased fly clinging to a pine needle with a noticeably swollen abdomen. (C) The abdomen has burst open and spores (visible on the wings) are being dispersed. (D) A long deceased fly, still attached to a pine needle via its fungal mouth anchor.

their hosts to seek out a well-positioned plant above an ant trail, climb up the plant, and bite a vein on the underside of a leaf. At this point, the fungus takes over by destroying the mus cles that allow the ant's jaws to open while growing hyphae out the ant's mouth and into the plant, locking it in place. It then digests the rest of the ant and produces a fruiting body that rains spores upon the unsuspecting ants below.

An even more gruesome spore-dispersal approach is used by other parasitic fungi. For example, *Massospora cicadina* and *Erynia cas trans* don't significantly alter the behavior of their hosts (cicadas and flies, respectively). Instead, they allow the host to go about business as usual, but with a gaping hole in their abdomens through which spores are constantly released. In *M. cicadina,* the entire back half of the cicada host falls off to reveal the spore mass while the cicada is still alive (see *Mycelium* v41n1 for more on this fungus).

The tiny nematode worms that inhabit soil and rotting substrates also fall victim to fungal predation. Nematodes are actually a sister group of the arthropods - they both belong to the clade Ecdysozoa - animals that moult their exoskeleton. Some of our valued edibles, including *Coprinus comatus* (shaggy mane), *Stropharia rugosoannulata* (wine cap), and *Pleurotus ostreatus* (oyster), are responsible for the deaths of countless nematodes every year. Nematophagous fungi can use several methods to capture their prey, including glue-like traps, constricting rings, and poisons. Once captured, hyphae penetrate the doomed worm and digest it from the inside. By consuming these creatures, the fungi gain vital nutrients that may otherwise be lacking in their habitat.

In addition to these direct adversarial roles fungi play in the lives of bugs, fungi can also take the 'bugs' food away by making their food plants undesirable. This can happen with endophytic (growing within a plant) fungi, which colonize a host plant and often form a mutualistic relationship with that host, exchanging plant nutrients in return for defense from predation. The endophytic fungus can prevent grazing by insects by producing poisonous chemicals or altering the chemical composition of the plant to make it less nutritious. This can help the plant at the expense of the insect, but can also be thought of as the fungus protecting itself and its host from marauding insects.

Most of us with experience collecting wild mushrooms have experience with insect fungivory, often manifested by worm holes in our favorite edibles. Fungivory among insects is extremely widespread, with some insects specializing in eating specific fungi. Although some fungi can actually benefit from this interaction (see below), many do not. As a result, fungi have evolved to produce numerous insecticides to help deter grazing bugs. For instance, the

soil mold *Aspergillus nidulans* is predated by springtails (tiny soil insects) and, when the mold detects an attack, it triggers its chemical defenses that help protect it from these tiny grazers.

Commensalism

Like us, insects have many microbes inhabiting their guts, some of which are beneficial, but others, like Harpellales species, are appear to be neither good nor bad for the host; these have been termed commensal. While the insect is largely unaffected by the presence or absence of Harpellales in their guts, the Harpellales species benefit greatly - in fact, they are only found in the guts of bugs. Harpellales are not always commensal - in certain cases, they can also be parasites, and in others they can be symbionts, providing the bug with essential nutrients that might otherwise be lacking in its diet.

Working together

Perhaps the pinnacle of symbiotic gut fungi is among wood-eating bugs. Wood is very hard to digest, but fungi are are the only organisms recognized as being able to rot the lignan component of wood. Many wood eating insects have in their guts one or more yeasts capable of fermenting xylose, a major component of hemicellulose.

In addition to having endosymbiotic yeasts in their guts, some bark beetles have a different symbiosis with fungi: using it as a weapon. For instance, the mountain pine beetle, which likes to lay its eggs under the bark of pine trees, introduces blue stain fungus (*Grosmannia clavigera*) into the pine's sapwood which effectively clogs its plumbing and also prevents the pine from exuding its protective tar and killing the invading beetle. Together, the beetles and fungus overwhelm the plant's defenses and cause the tree's death. The pair are so successful that, in recent years, they have devastated lodgepole pine populations along the Rockies.

The blue stain fungus (*Grosmannia clavigera*) growing within pine. Inset, the mountain pine beetle which works with *G. clavigera* to overpower and kill pine trees. U.S. Forestry Service Public Domain Photo.

Ambrosia beetles, instead of eating wood that is then broken down by a fungus, eat a fungus that they farm on wood. These beetles (several types of weevil) carry with them "seeds" of their soon to be planted crop - their symbiotic fungus. They then burrow into a recently deceased, sickly, or, more rarely, healthy tree, planting the fungus within. The ambrosia beetles then consume part of the fungus and continue to spread it around the inside of the tree by making tunnels and inoculating along the way, also raising their young on this fungal feast. Each type of ambrosia beetle has its own specific set of ambrosia fungi that it likes to plant.

If ambrosia beetles are subsistence fungus farmers, than leaf cutter ants are industrial fungus farmers: they grow huge quantities of fungus in chambers within the colony and this fungus makes up the colony's only food. These industrious little ants track down their domesticated fungus's favorite plants, cut them to pieces, clean the pieces, and place this growing material in their fungal garden. Not all ants in the colony are responsible for collecting growing materials; some ants are responsible for disposing of used up substrate, and still others are responsible for maintaining the health of the crop. The fungus they cultivate is their only food and when new queen ants are born, they carry some of the mycelium with them to start their own colony. Other attine ants (the group

Leaf-cutter ants from Peru (Photo: Public Domain)

The rust fungus *Puccinia graminis* causes stem rust of wheat, a disease of economic importance. The "insect-pollination"-like stage of its lifecycle occurs on its secondary host, the barberry. (Photo: Public Domain)

including the leafcutters) also farm fungus, but these tend to collect forest litter as a growth substrate, rather than collecting live leaves. Again, the symbiosis is very specific, with certain ants preferring certain fungi - some grow mushrooms (e.g. *Leucoagaricus* and *Lepiota*), some coral fungi, and some yeasts. African termites take a similar approach, chewing up woody material and growing their food fungus. Their symbionts, aptly named *Termitomyces*, produce large mushrooms in the rainy season as they fruit. Even bees are known farm fungi. *Scaptotrigona depilis*, a stingless Brazilian bee, seals its young into wax chambers with chewed up food that is actually a substrate for a symbiotic fungus. This fungus is then eaten by the young bee. Clearly fungus farming is a very effective strategy for survival - it's no wonder we decided to pick up this habit, too.

An altogether different form of mutualism occurs between rust fungi and insects that is much more akin to the the relationship between plants and their pollinators. Certain rust fungi (e.g. *Puccinia graminis*), parasites of plants that cause orange rust-like sores on plants, exude a sweet sap derived from the host plant, but filled with fungal spores. This sweet sticky liquid is then visited by hungry insects that travel from infected leaf to infected leaf, allowing two compatible fungi to mate and ensure the survival of the next generation. Stinkhorns use a similar strategy in dispersing their spores. Their spore mass has such a vile smell that flies (especially those that feed on carrion) are attracted to the fungus and consume the sticky sweet spore mass. This spore mass, in addition to spores and the volatiles that attracted the flies, contains sugars and laxative components. A short time after consuming the spores, the flies defecate unharmed spores onto a new substrate. Given that the spore mass contains both laxatives and potential nutrients, it is unclear if the flies actually benefit from this transaction.

Finally, perhaps the most peculiar symbiosis is between *Septobasidium* and scale insects. Scale insects are small plant parasites that adhere to the surface of a plant and live off of nutrients sucked from the plant. Because they are immobile, they have evolved numerous mechanisms for self defense. *Septobasidium* is a genus of fungi that form something like a barn surrounding the scale insects by growing lichen-like across the surface of the plant and around the scale insects. The fungus derives nutrients from the insects which in turn parasitize the tree, while providing protection for the insects with its shelter. The fungus traps each scale insect in its own chamber, allowing the young of the scale insect to escape, but preventing potential predators from accessing the adult scale insects. The fruiting of the fungus often coincides with hatching of the young scale insects. This way the young scales will pick up spores and carry them to the next plant host. Once the young scale insect attaches to a new plant, a new fungal thallus forms, developing a new colony of scale insect and fungi. However, this can also range from mutualism to

parasitism, since when predators are lacking, the fungi are taking without providing anything in return.

The worlds of fungi and insects frequently collide, sometimes with benefits to both, but often with one partner losing out. Many of these interactions are so important that one or both organisms couldn't exist without the other. Some, like the African termites, leaf cutter ants, and pine beetles with their fungal symbionts, are of great ecological importance and help shape the world around them. Others, like *Beauveria bassiana* and the insects it preys upon, are of great economic importance. We should consider ourselves lucky that the two are adversaries as much as they are partners, or together they would surely take over the world!

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Previously published in *Mycelium*, Volume 42, No. 1, January-March, 2016

NAMA EDUCATIONAL COMMITTEE UPDATE

"The Fungus Files, 2nd edition" a teaching guide about fungi for grades K-6, is now on the NAMA website. The full contents of the book may be downloaded. The Fungus Files - North American Mycological Association.

Biographies NAMA Regional Trustees

David Wallis

Since joining NAMA in 1995, David has served as a member at large of the Executive Committee, Trustee for Region 10 (now Rocky Mountain), and Club Trustee for the New Mexico Mycological Society and the Four Corners Mushroom Club. David also contributed a few years as NAMA's website content manager, initiated the Website Committee, and served as that committee's first chairperson.

David is wrapping up his fifth term a president of the New Mexico Mycological Society and has also served that organization as Foray Chair, Newsletter Editor, and Webmaster. His mycological pursuits take him from his backyard in Albuquerque to the mountains of northern New Mexico and southern Colorado.

Gene Kremer

With a background in biology and chemistry and a lifetime commitment to conservation, science and living systems, Gene Kremer is working on an ongoing fungal inventory for the Boulder Lake Environmental Center (Duluth) and as well as writing their brochure. He is facilitating the post-foray discussion for the Paul Bunyan Mushroom Club, and has contributed to its recent organization. Gene is also runs occasional nature walks that focus on fungi. He is developing a herbarium of fungi on his land, and continues to learn and practice fungal microscopic technique and share his knowledge in the woods with others.

Story About Gene Kremer from Sandy Sheine

One Sunday this winter, our club, MMHC, the Michigan Mushroom Hunters Club, had a business meeting with 61 people in attendance. Gene Kremer showed up and introduced himself as a candidate for Regional Trustee. We were delighted to meet him and glad that NAMA finally found a replacement for Jerry Sheine. The day of the meeting was cold and snowy. Gene had driven to the meeting from Duluth, MN, driving through the Upper Peninsula which was covered with snow. He stayed overnight in Grayling, MI and drove down to Farmington Hills, MI on Sunday in another snowstorm. We had a huge potluck lunch and then had our meeting. We had not had a quorum to change some of our bylaws for two years. Our Vice President, Jerry Watson, called 55 members to come to the meeting so we could vote. They all came in the snowstorm, including Jerry and myself. Gene introduced himself to us and to other members of our club. Gene then drove back to Grayling, stayed overnight and drove back to Duluth on Monday.

Web Links to Fungi in the News

Effects of Drought on Forests and Rangelands in the United States: A Comprehensive Science Synthesis, http://www.fs.fed.us/sites/default/files/DROUGHT_book-web-1-11-16.pdf.

Mushroom Death Suit is the latest in Post-Mortem Fashion, http://www.atlasobscura.com/articles/the-mushroom-death-suit-is-the-latest-in-postmortem-ecofriendly-fashion.

Plants Talk to Each Other Using An Internet of Fungus, http://www.bbc.com/earth/story/20141111-plants-have-a-hidden-internet.

Fungal Toxins Are Poisoning Africa's Children, http://www.sciencemag.org/news/2016/02/fungal-toxins-are-poisoning-africa-s-children-says-new-report.

The Minnesota Winter Solution

By Ron Spinosa, Chair of the NAMA Cultivation Committee

So what's a poor Minnesota mycophile to do when the polar vortex bears down on frozen tundra under foot and the Chanterelles of summer are only a dim memory? Well you could pull out your copy of Michael Beug's Ascomycete Fungi of North America and brush up your knowledge of those obscure little cup fungi. Or maybe you could try to learn the new names of your favorite mushrooms that have been rudely renamed dictated by the latest phylogenetic tree .

Here is a better idea! Why not grow some oyster mushrooms at home during the dreary reign of Winter Solstice. Oh, you say you don't have a bale of straw handy to pasteurize on your kitchen stove. No problem—one of our own NAMA members, Milton Tam (of the Puget Sound Mycological Society) has done the research and devised a low cost, low tech method of growing oyster mushrooms at home that is so simple and easy even a school kid can do it! And furthermore, there is no heat, no chemicals and no sweat involved. All you will need is kitty litter, guinea pig chow, oyster spawn, water and a plastic bag. That's right—kitty litter, but not just any KL—please, no "used" KL, nor the clay based clumping variety. You will need Yesterday's News Kitty Litter from Purina. As you may have guessed, Yesterdays News Kiddy Litter is made from recycled newspaper that's been pulverized and turned into highly absorbent pellets. I get my Yesterday's News at Cub Foods in Saint Paul, but you will probably find it in other big box stores, which might carry the guinea pig chow as well.

The beauty of Yesterday's News Kitty Litter, besides absorbing 4 times its weight in water, is that it is clean, and the interior of the pellets is most likely sterile. I'm sure Purina would strive to eliminate any microbial pathogens that might harm someone's precious kitty. The same would be true for the guinea pig chow, which consists of pelleted alfalfa and serves as a nitrogen supplement for the lignocellulosic paper based pellet substrate. What about the ink? News print is required by industry standards to be made with soy based ink, and even if it were petroleum based, we know oysters can eat the vile fossil fuel and come out smelling like, well, a *Pleurotus*.

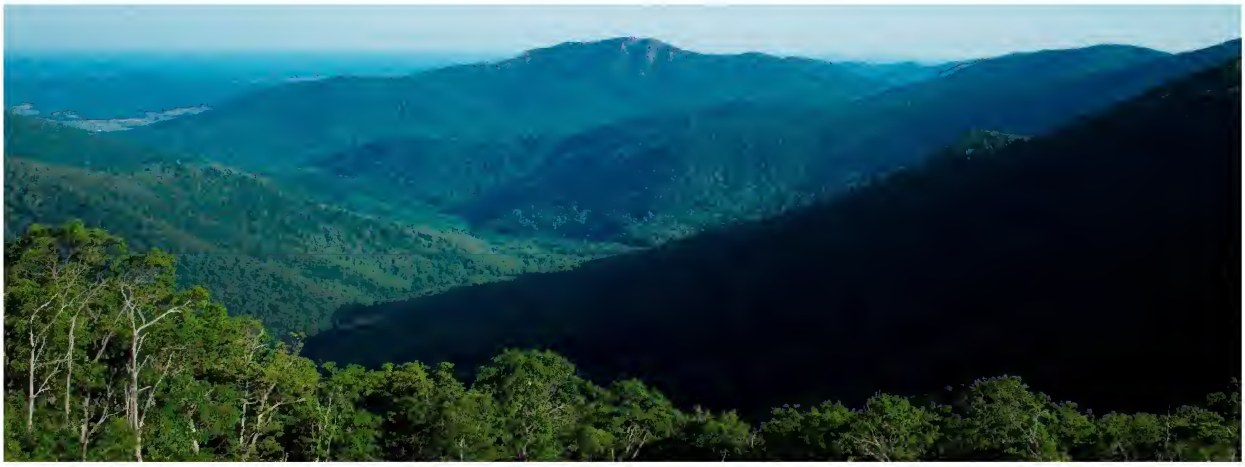
Oysters on kitty litter © Photo by Milton Tam

Milton Tam has been using his technique for mushroom education classes in the Seattle area for a number of years. The kids love it! Milton made his discovery known to the world in the Winter 2013 issue of Fungi Magazine.* I could give you the simple instructions for the oyster KL technique here, but I would rather direct you to the cultivation pages of the NAMA website that perhaps you have never explored. There you will find a wealth of information on mushroom cultivation, including an illustrated pdf file of Milton Tam's Oyster Mushroom – Kitty Litter protocol. Please check it out!

http://www.namyco.org/cultivation_substrates.php

http://www.namyco.org/docs/grow_oyster_mushrooms_on_kitty_litter_illustrated.pdf

*Milton Tam. Home Cultivation: Non-sterile Cultivation of Oyster Mushrooms. *FUNGI Magazine*, Vol. 6, No.4 - Winter 2013.



A view from Shenandoah National Park's Skyline Drive. Photo by JD Mathewson.

Amanita canadensis (Tulloss *nom. prov.*) = Peck's *Amanita*, *Amanita peckiana* (Kauffman)

By Yves Lamoureux
Scientific adviser, Cercle des mycologues de Montréal

Adaptation and translation of a French text originally published by the author on his Flickr gallery:
https://www.flickr.com/photos/27441280@N06/9597138832/

Amanita peckiana is characterized by its thick large volva, evanescent annulus, amyloid spores, and its browning with age or when desiccated. At maturity, its cap is slightly striate.

Its amyloid spores classify *Amanita peckiana* in the subgenus *Lepidella*. This species belongs in section *Amidella*, with only two other entities identified in Quebec: *Amanita volvata* and *Amanita pseudovolvata*. Both species have a thick volva and brownish color as they mature or dry out.

In the genus *Amanita*, subgenus *Lepidella* differs from subgenus *Amanita*. Species in the latter produce inamyloid spores and the cap margin is often lined with striations at maturity. On the other hand, species in the subgenus *Lepidella*, produce amyloid spores and the cap margin is not striate, even at maturity.

Species of section *Amidella* can be confusing to persons using rules of thumb such as "striate cap margins are likely to be associated with inamyloid spores." This is why rules of thumb need to be treated with a grain of salt.

1. *Amanita peckiana*. Young basidiocarp.

2. *Amanita peckiana*. Notice its delicate annulus.

The first time I picked this species was in 1992 (only one basidiocarp). Knowing that it was a species of interest, and that I couldn't identify it with certainty, I send it to Rod Tulloss—the *Amanita* expert. His identification key,

for section *Amidella*, which is unpublished, had at that time three species with provisional names.

That same year, Rod told me that it was a species that was new to science and had not yet been described, and that provisionally he would call it "*Amanita canadensis*".

Rod's justification for the creation of a new taxon was based on his study of the sub-hymenium of the *Amanita peckiana* type collection which showed it comprised narrow hyphae with no inflated elements, whereas all the other *Amidella* species had a sub-hymenium comprising a layer of 1 to 8 inflated cells depending on species.

After having sent my recent pictures of this *Amidella* to Rod, he informed me that his initial interpretation of the *Amanita peckiana* hyphae sub-hymenium was based on his inability to rehydrate the lamella tissue of the type collection. This prevented him from seeing the inflated cells. The latter's sub-hymenium actually has 4 to 6 layers of more or less inflated cells, as observed on my two collections of the species.

Therefore, *Amanita canadensis* is lost in limbo and will never appear in a book (thankfully). In my book, *Champignons du Québec*, (*tome 2, Les Amanites*), *Amanita peckiana* is named *Amanita canadensis*… that will be rectified!

3. *Amanita peckiana*. Longitudinal section of stipe base. Notice browning of flesh.

Amidella spp. have a multi-layered univeral veil consisting of an outer membranous layer, at least one interior layer that is very thick and contains numerous inflated cells, and an inner surface layer that is often friable. When *Amanita peckiana* expands, a large volva is left at the base of the stem. Many species may have a few patches from the inner surface layer left on the cap.

At maturity, those veil remnants cover the cap leaving it fibrillated or with intermittent shreds. Also, the fibrils brown

quickly once the cap ruptures the universal veil. In addition, all parts of the fruiting body become reddish-brown when touched or at maturation, and that goes for all *Amidella* species.

One can easily see the difference between *Amanita peckiana* and other similar species because of the annulus on young basidiocarps. It is the only known species in section *Amidella* to have a ring, although it is ephemeral, as can be seen in the attached photographs. If only a mature specimen is found, it is essential to examine the spores and the sub-hymenium cells.

To conclude, *Amanita canadensis* is obsolete. My find is *Amanita peckiana* (Kauffman), a species that has been described and published, yet is little known. I am hoping that this explanation will better define its features.

Notes on the gatherings in Lanaudière: No Lamoureux 4253 (YL fongarium). Sainte-Julienne, August 23 2013.

Habitat: mixed oak forest (red oak, beech, white pin, hemlock, sugar maple, etc.), limestone soil. Only one basidiocarp found.

Sub-hymenium has 4 to 6 cells that are more or less inflated.

Amyloid spores, ± elongate to cylindrical, 11.6-13.4 x 5.1-5.8 µm.
Q=1.83-2.64, Q^E=2.20.

Amanita volvata differs from *Amanita peckiana* by the absence of an annulus, the cap often has patches of thick, fibrillose volval remnants, and its spores are wider, 6-7.5 µm.

Amanita pseudovolvata, which is the most common of the three entities found in Quebec, differs from *Amanita peckiana* by its small size, lack of annulus, and its small spores, 9-11 x 5.5-6.5 µm, Q^E=1.75

***Amanita* guide, s.g.** *Lepidella*, **section** *Amidella*, **in Quebec**

1a- Annulus present on young basidiocarp, but rapidly disappears; no thick volval remnants on cap; basidiocarp medium to tall; spores $Q^E \geq 2.20$… *Amanita peckiana*

1b- Annulus always absent even on young basidiocarp; cap sometimes has patches of thick volval remnants; basidiocarp small to tall; spores $Q^E \leq 2.2$
2a- Small species, rarely more than 10 cm tall at maturity; spores 9-11 x 5.5-6.5 µm… *Amanita pseudovolvata*

2b- Medium to tall species, more than 10 cm at maturity; spores 10-14 x 6-7.5 µm… *Amanita volvata*

Author's note: Since its original publication, a new species from section *Amidella* has been added to the Quebec fungal list. It is *Amanita dolichopus* Tulloss. See text on the author's Flickr gallery:
https://www.flickr.com/photos/27441280@N06/24402088561/

Translation from French: Paula Flipot
Editor: My thanks to both Rod Tulloss and Steve Trudell for assitance with translation and editing.

Interested in Learning More about Fungi? Please read on.

This is a survey to find out if there is interest in expanding the educational programs for NAMA members. The additional programs considered are structured programs relating to taxonomy and identification covering all levels of mycological expertise. For example, beginners level would deal with identification of major groups and introduction to the use of keys and scientific terminology; on an advanced level the program could deal with taxonomy of specific groups and even with individual genera with the use of microscopes. An essential part of every workshop would be a hands-on component. Depending on the material covered, the workshops could be offered during the days preceding the annual foray or planned by regions on dates depending on the season, the available location and the material covered.

Below is a brief survey to measure the level of interest in the development of such a plan and the level of participation that could be expected. Please reply within 10 days of receiving this survey. Print, fill in, scan and then email completed form to: NAMAeduSurvey@gmail.com **OR** mail it to: Barbara Ching, NAMA Executive Secretary, 2019 Ashmore Drive, Ames, IA 50014. Thank you for your cooperation.

Workshops:

I would be interested in the following programs:

Identification of major groups of fungi (for beginners); _____
Recognizing major genera of Ascomycota or Basidiomycota: _____
Introductory microscopic techniques; _____
Workshops on individual genera, without microscopy; _____
Workshops on individual genera, with microscopy; _____
Preparing and documenting specimens for scientific study; _____

I would be interested in learning about the following topics:

Use of taxonomic keys; _____
Scientific terminology; _____
Use of stains and other chemicals in fungal taxonomy; _____
Art and photography for documentation; _____

Workshop Location:

I would be interested in attending a workshop if offered:

Locally: _____
Within driving distance to where I live:
As a pre-foray workshop: _____
Embedded within the annual foray program; within my region: _____
Not interested: _____

I live in the state of _____

Thank you for participating in the survey; any suggestion for building this program is welcome, and may be submitted with the survey.

If interested in helping to build such a program or teaching components, please provide your name and e-mail or snail-mail address. Thank you.

New *McIlvainea* Article

"Three Popular Medicinal Mushroom Supplements: A Review of Human Clinical Trials" by Megan Frost. M.Ed., MLS of Brigham Young University. http://www.namyco.org/three_medicinal_mushroom_supplements.php.

LACTARIUS WORKSHOP

NAMA is pleased to announce an in-depth class on the genus Lactarius, to be taught by Dr. Andrew Methven in early fall from September 12 through September 15, 2016, at Wildacres Retreat, located just off the Blue Ridge Parkway near Little Switzerland, North Carolina. (This is the same location as the annual NAMA Regional Wildacres Foray.)

Participants will develop an in-depth appreciation of the classification and phylogeny of Lactarius species that occur in the southern Appalachian Mountains. Emphasis will be placed on the analysis of macro- and micro-morphological features in the identification of taxa. The daily routine will consist of a morning lecture followed by a field trip until early or mid-afternoon. Collections will be examined and identified after returning from the field and an opportunity provided to assemble a collection of dried specimens. The laboratory will remain open in the evenings for additional work on collections.

Attendees must be NAMA members, have basic fungal microscopy knowledge and provide their own microscopes and necessary materials.

Class is limited to ten (10) participants. Cost per person is $250. The registration deadline is August 1, 2016.

For more information and to register, contact Glenda O'Neal : glendakoneal@yahoo.com or by phone (423)-863-2742.

WILDACRES REGIONAL FORAY!

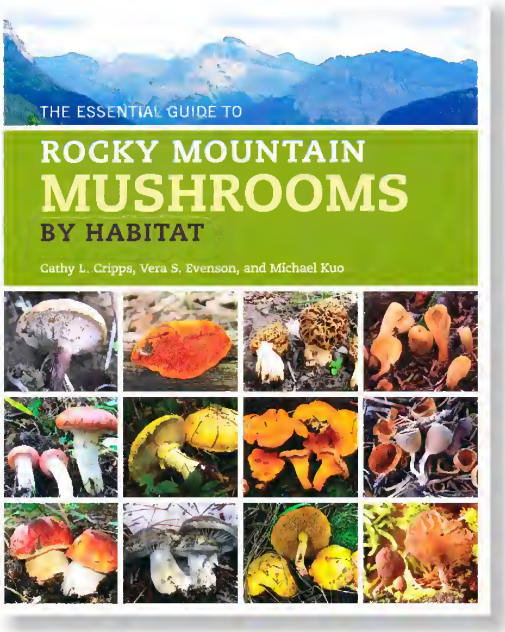
The annual NAMA Wildacres Regional Foray is unique for several reasons, not the least of which is the awesome natural beauty of the area, including Mt. Mitchell, at 6,684 feet elevation, the highest peak east of the Mississippi River. If you stop along the Blue Ridge Parkway, you will find evidence of the season's bounty, including a huge diversity of mushrooms.

The 2016 Wildacres Foray is scheduled for August 18-21, 2016. Wildacres Retreat located just off the Blue Ridge Parkway near Little Switzerland, not to far from Spruce Pine, North Carolina. Wildacres is renowned for the identification of new species to the foray and to the identification of new species to the mushroom kingdom. You will have the opportunity to search for fungi along the creek sides of Armstrong Creek and Crab Tree Falls, in the highlands of Mount Mitchell, and in many other areas along the beautiful Blue Ridge Parkway.

Please contact Glenda O'Neal, by email or by phone (423) 863-2742 for more information. Registration fee for this foray is $240 per person double occupancy and includes three nights lodging and eight meals.

The Essential Guide to Rocky Mountain Mushrooms by Habitat

Cathy L. Cripps, Vera S. Evenson, and Michael Kuo
2016, University of Illinois Press, 272 pages
978-0-252-03996-6 (Hardcover, $95.00)
978-0-252-08146-0 (Paper, $29.95)
www.press.illinois.edu



And the new regional mushroom guides keep coming. This attractive new guide to the mushrooms of the Rocky Mountains comes close on the heels of Vera Evenson's *Mushrooms of the Rocky Mountain Region: Colorado, New Mexico, Utah, Wyoming* ("Evenson-II," reviewed in the September-October 2015 issue of *The Mycophile*). However, it takes a different approach to presenting the mushrooms, namely an environmental one. The authors all are well known among amateur mushroom hunters. Cripps, a former student of Orson Miller's, teaches at Montana State University and is known for her research on the fungi of aspen forests and high mountain habitats. Evenson is the curator of the Sam Mitchel Herbarium of Fungi at the Denver Botanic Gardens and a past president of the Colorado Mycological Society. Kuo teaches English at Eastern Illinois University and maintains the website, *MushroomExpert.com*. Both Cripps and Evenson have received NAMA's Award for Contributions to Amateur Mycology.

Larger than many field guides (about 8 × 12 inches), the book dispenses with much of the usual information geared to the beginning mushroom identifier. Thus, the Introduction is relatively short (only 11 pages). It includes a general description of the Rocky Mountains chain and its vegetation, pointing out how conveniently the latter is organized into a series of elevational zones, basic information on the ecological roles of fungi, how to determine spore color, and the authors' suggestions for how to use the book. The latter involves a simple process—figure out in which habitat you found the mushrooms, go to that chapter of the book, look at the pictures, and read the descriptive information. Because only a limited sampling of the fungi that occur in the different habitats is presented, an alternative approach is provided for the frequent cases where your mushroom fails to match any of the species in that chapter. A simple key is included at the end of the species accounts that can be used to identify the mushroom (if it is one that is in the book) based on macromorphologic features. The species' page-number references are given in the key, or one can go to a chart inside the front cover that shows, for each species, in which habitats it can be found. Essentially half of the species are listed as occurring in more than one habitat, with burned ground and alpine having the largest proportion of single-habitat species.

The bulk of the book is devoted to the habitat descriptions and mushroom species accounts. Following that, it concludes with the key mentioned above, a page of cautionary information about edibility, over seven pages of references, and separate indexes for fungi, plants, and animals.

As one would expect from the title, the mushroom accounts are organized by habitat-chapters. These, in turn, are organized within four general elevational zones and include: foothills (prairie [9 mushroom species], semi-arid shrublands [9], cottonwood riparian [14]), montane (ponderosa pine [13], Douglas-fir [8], aspen [17], and lodgepole pine [15] forests and burned ground [10]), subalpine (spruce-fir forests [23], snowbanks [14], and high-elevation pine forests [10]), and alpine (alpine [8]). Each habitat/chapter is introduced with five or six pages of information about the characteristic tree, other plant, and animal species, supported by lots of photos of both the habitat and species.

Each species treatment includes a description of macroscopic features, geared to its morphologic type (gilled mushroom, bolete, puffball, etc.) and ecological occurrence, followed by a few sentences of observations. The latter typically include a common name, if there is one, familiar synonym(s), if there are any, edibility, mention of similar species, and so forth. All of the descriptive information and comments are fairly brief. Technical terms generally are avoided and microscopic features are included only rarely.

Disappointingly, only 150 species are described and not many others are mentioned in comments with enough information to be useful. Thus, the book registers a total of only 5 species per dollar (in softcover; and only about 1.5 in hardcover). This compares with 7 spp/$ in Evenson-II, and both totals are low compared to other recent regional guides such as *California Mushrooms: The Comprehensive Identification Guide* (11 spp/$) and *Mushrooms of the Pacific Northwest* (nearly 17 spp/$). However, Cripps et al. chose their species wisely, as a large percentage of them do not appear in other guides. Just over half of them do not occur in Evenson-II and even if you own both of Evenson's books (Evenson-I being *Mushrooms of Colorado and the Southern Rocky Mountains*), plus *Mushrooms of the Pacific Northwest* and Jack States's *Mushrooms and Truffles of the Southwest*, there would still be nearly 50 species that appear only in the new guide. Coverage includes seven amanitas, seven tricholomas, six corts, six russulas, six suilluses, six hygrophoruses, five calvatias, and five lactariuses. Surprising was the lack of inocybes—not a single one, and Cripps is one of the world experts in the genus.

I was immediately struck by the size of the mushroom species photos— they are very large (mostly 4.25 × 7 inches), occupying the upper half of each page. Their quality ranges from excellent to poor, with most being good and certainly usable for identification purposes. Quite a few are less sharp than they should be, perhaps having been printed from files that lacked sufficient resolution or because the camera was hand-held. Some exhibit limited depth of field, lack of focus on important points, poor color rendition, or unappealing compositions. The large size comes with an important trade-off. The use of so much space prevented the inclusion of more species. Halving the size of each photo would still yield a good-sized image and would have freed up enough space for perhaps another 75 species without increasing the page count.

So, should you buy this book? Those with large mushroom libraries will doubtless want to add this one. It is attractive, authoritative, and well written. Determined mushroom identifiers who are more selective in their buying habits will need to weigh the limited number of species included and the lack of information on microscopic features versus the high percentage of species that aren't in other books. For those who are just starting out and/or are without a guide for this region, this one provides fewer species for a slightly greater price than Evenson-II and so the latter would probably make a better first purchase, both for its somewhat greater coverage and its inclusion of more basic information for learning to identify mushrooms. I suspect that the inclusion of many pictures of trees, wildflowers, birds, and large creatures will especially appeal to general naturalist types and so the book could serve as a welcome present for that special hiker friend.

Steve Trudell

RECOMMENDED READING FOR MOREL HUNTERS

There is a wonderful article in the Foray Newfoundland and Labrador newsletter, *Omphalina*, Vol. VII, No 2, February 14, 2016 entitled "Our Morels Are Named" by Andrus Voitk, Kerry O'Donnell, Michael Beug, Michael Burzinski and Henry Mann. I wanted to republish it in in this issue of *The Mycophile* for you, but due to lack of sufficient space I hope to do so early next year. In the meantime, I urge you to go to http://collections.mun.ca/cdm/compoundobject/collection/omphalina/id/2006/rec/59 to read the article online, download or print.

Wildacres Regional Foray
AUGUST 18-21, 2016
Wildacres, North Carolina

Dr. Andrew Methven will be returning as our mycologist!

To register, complete this form and mail with a check, payable to NAMA, for $240 per person to:

Glenda O'Neal
1038 Wateree Street
Kingsport, Tennessee 37660

Info: glendakoneal@yahoo.com
Phone: (423) 863-2742

Persons sharing a room may use the same form.

Name_____
Male_____ Female _____
Address_____
_____
Phone _____
Email_____

Dietary Requests _____
Bedding Preference: Double___ Single____

Name_____
Male_____ Female_____
Address_____
_____
Phone _____
Email_____

Dietary Requests_____
Bedding Preference: Double___ Single ___

I wish to room with _____.

Participants in this foray will be limited to 40 persons, double occupancy. There are no private rooms.

The cost of the foray covers 3 nights lodging and 8 meals, beginning with an evening meal on Thursday August 18th and ending with breakfast on Sunday August 21st.

Liability waiver:

By signing below I release the North American Mycological Association, its officers, and members from any and all liability and loss arising from any accident, injury, or illness which may result from activities of the NAMA regional foray at Wildacres.

Signature #1: _____ Date:_____

North American Mycological Association
Steve Bichler
6018 Illinois Lane SE, Unit B
Lacey, WA 98513-3617

Change Service Requested

Newsletter of the North American Mycological Association
THE MYCOPHILE

Mushroom of the Issue: *Mycena subcaerulea* by Walt Sturgeon

THE LITTLE BLUE (*Mycena subcaerulea*)
Blue mushrooms are always a treat for the eyes and a pleasure to find. Perhaps the most famous is the Indigo Milk Mushroom, *Lactarius indigo*. Its deep blue and silver colorations are eye catching and as a bonus, it is edible. In the poroid fungi, *Neoalbatrellus caeruleoporus* has grayish blue caps. *Terana caerulea* is a dark blue crust fungus. Some *Cortinarius* have blue tones as well. Note the names all refer to the colors. Caerulea is blue in Latin and indigo is a shade of dark blue.

The Little Blue is just that, a small blue mushroom. Its name is *Mycena subcaerulea* which I interpret as meaning almost blue. This is appropriate for this quickly fading mushroom. It is often overlooked or passed over because of its small size and colors at maturity and as being just another unidentifiable *Mycena*. In Eastern North America it fruits for a few weeks right after the morel season and then again in late summer. In Ohio it is most commonly observed in June.

Look on decaying logs of broadleaf trees. Oak logs are a favored host. Its caps are about 2 cm. or less in width. When first emerging the buttons are a rich, blue color sometimes spectacularly set off by an aqua margin. In age the viscid caps fade to gray, greenish or brownish often with bluish tinted margins. The gills are white. The stem is powdery dusted and at its base look for bluish mycelium. Photographers hope to find this mushroom when the caps are still mostly blue. It is a tiny splash of color in the late spring woods.

Photos and description by Walt Sturgeon